



Forage Management

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TALL FESCUE

Tall fescue (*Festuca arundinacea* Schreb.) is a grass adapted to a wide range of growing conditions. It is the best forage grass for late fall and winter grazing and when used in this manner can effectively reduce livestock wintering cost. However, in some situations, tall fescue causes animal production and health problems. Since tall fescue can provide major benefits and major problems, farmer's reactions to this forage species are often mixed and intense.

Description

Tall fescue is a vigorous, perennial, bunch grass which may have short slowly spreading rhizomes. Under good management tall fescue is deep-rooted and forms a dense sod. Tall fescue tolerates wet soils and short periods of flooding and is also drought tolerant. It is tolerant of low soil pH but is most productive when the soil pH is 5.8 or greater, phosphorus and potassium are medium to high, and soil nitrogen is readily available. Because of its wide range of site adaptation and its vigorous seedling growth, tall fescue is often used to seed roadsides and reclaimed disturbed areas.

Under good growing conditions tall fescue will grow to 48 inches or more in height. The seed head is a loosely branching panicle (Figure 1). The leaf of tall fescue is rolled in the bud stage (when the leaf is in the previous leaf sheath) and the plant has a round tiller base (Figure 2). The leaf blades are 1/8-1/2 inch wide and 4-24 inches long. Tall fescue leaves are a yellowish to dark green color depending on the availability of soil nitrogen. The upper leaf surface is dull with distinct veins running the length of the leaf. The lower leaf surface is smooth and glossy and is slightly keeled. The leaf margin is rough.

There is a distinct collar between the leaf blade and the round leaf sheath or "stem". This collar is broad, hairless and yellow green to cream in color. At the front of the collar there may be short, blunt, claw-like auricles 0.5 - 1.5 mm long. Where the



Figure 1. Tall fescue seed head, plant crown showing reproductive and vegetative tiller seed and flower spikelet.

collar meets the sheath there is a short, greenish, membranous ligule about 2 mm long.

Tall fescue is similar in appearance to ryegrass. In fact, some of the modern fescue varieties are hybrids of fescue and ryegrass. Tall fescue is different from perennial ryegrass which has a leaf that is folded in the bud stage. Tall fescue is different from Italian ryegrass which has a smooth leaf margin and a longer, more prominent ligule.

Tall fescue goes to head later than orchardgrass and Kentucky bluegrass. It is similar to these two grasses in that its growing point remains near the ground during vegetative growth. Tall fescue maintains most of its carbohydrate energy reserves in the tiller bases.

Tall Fescue Endophyte

About 80 percent of the tall fescue stands in West Virginia are infected with a fungus called an "endophyte" (*Acremonium coenophialum*). An endophyte is a fungus that grows inside another plant, without causing any apparent harm to the host plant and in some cases providing benefits to the host. The tall fescue endophyte appears to be a fungus which benefits the fescue plants. This endophyte produces chemicals called "alkaloids" which protect the tall fescue from insects and nematodes making the plants more tolerant to marginal soil environments and harsh management conditions. Some of these alkaloids are the cause of poor animal performance and health when consumed at too high a level. The complex of performance and health problems is often called "fescue toxicosis". The main effect of

endophyte alkaloids on ruminant livestock appears to be on heat regulation and feed intake. In horses the alkaloids can cause abortions and reduced milk production in mares consuming infected tall fescue during pregnancy.

Ergovaline is one of the endophyte alkaloids. This alkaloid causes the constriction of blood vessels in animals. One result in cattle is reduced blood flow in blood vessels and capillaries under the animal's skin. When cattle are in a warm environment, the main way they have of losing heat from the body is to increase the blood flow through capillaries under the skin. This blood flow carries heat from the inner part of the body to the surface where the heat is lost to the air. However, if an animal consumes enough alkaloid to constrict these capillaries, the volume of blood flow and the amount of heat moved to the body's surface will be reduced. The animal will then be more subject to heat stress during of warm weather. A good analogy is an old tractor radiator. If you have an old radiator which leaks and you repair it by soldering up part of the core, it may do fine in cool weather but will over heat during hot weather. Cattle grazing endophyte infected tall fescue during the winter don't seem to have as much of a problem. During the heat of summer cattle grazing endophyte infected tall fescue spend a lot of time in the shade or in ponds or creeks trying to keep cool. This heat stress may cause reduced feed intake and decreased animal performance. Early embryonic death in cattle during hot weather may also be related to this heat stress.

The life history of tall fescue and its endophyte shows us some things to consider when managing tall fescue to reduce fescue toxicosis. In the cool, spring weather the tall fescue plant is leafy and palatable. The leaf's growing point is at or below the soil surface. In this vegetative growth stage the endophyte is located in the fescue's leaf sheath (the "stem" of the leaf below the flat blade). In May the fescue plant starts to produce reproductive tillers which develop growing points that rise above the soil surface, pushing the seed head up through the leaf sheath. As the fescue plant produces reproductive stems, the fungal endophyte moves up into the stem from the leaf sheath. As the seed head and seeds develop the endophyte moves into the seed head and invades the new seed. When the seeds fall to the ground and germinate the endophyte in the seed infects the newly formed plant, continuing the cycle. It appears that the only way the tall fescue endophyte is transmitted to a plant is through the seed from infected plants.

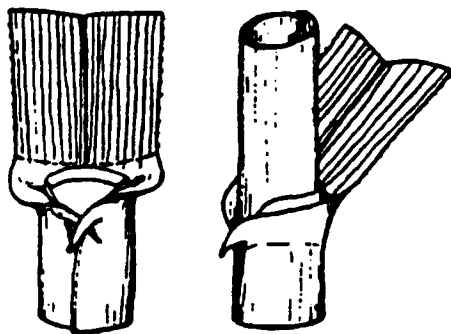


Figure 2. Vegetative characteristics of the tall fescue leaf, leaf collar, ligule, auricles and leaf sheath.

Endophyte infected tall fescue can become a serious weed in pastures since the infected plants are less palatable than other forages. This leads to the

livestock grazing the more palatable orchardgrass, bluegrass, and clover plants; leaving the infected fescue plants to grow and go to seed. Since the infected seeds are vigorous and resistant to insects, nematodes, and drought they can be very competitive. This allows tall fescue to rapidly invade a field.

Managing Tall Fescue for Fall and Winter Grazing

Livestock producers have mixed feelings for tall fescue due to the poor animal performance this forage. When tall fescue is used as part of a forage system containing other forage species, with the tall fescue being used primarily in the spring and winter seasons, there is seldom a problem. One of the best uses of tall fescue is for late fall and winter grazing. This is called "stockpiling" or "deferred grazing". Stockpiling is the accumulation of forage during a period of active growth for use when forage growth is slower. In late fall and early winter well managed stockpiled tall fescue is leafy, palatable, and high in protein, sugars, and digestibility. When tall fescue is used in the late fall and winter months when the weather is cool, the cattle are less liable to be heat stressed and perform better than when the forage is used in the warm summer months. Deferred grazing is a cost effective and environmentally friendly way of wintering dry beef cattle, ewes, and stocker cattle held for grazing the following summer.

Yield and quality of stockpiled tall fescue will be increased by providing adequate nitrogen for late summer and fall growth. This can be accomplished by growing the fescue with clovers or by applying nitrogen in the form of commercial fertilizer, manure, or chicken litter. Adequate nitrogen is needed to allow fescue to grow actively, produce proteins, and accumulate sugars during the cool fall weather. This results in the fescue being more tolerant to freezing as the weather turns cold and provides a greener, higher quality forage for grazing during the winter.

Tall fescue fields which have small amounts of legumes in them will respond well to nitrogen fertilization if the other plant nutrients and soil moisture are available. Nitrogen fertilized tall fescue will withstand freezing weather better than fescue grown with legumes. When using nitrogen, apply 50-100 pounds actual nitrogen per acre, depending on the amount of forage desired. Stockpiled tall fescue produces .50-.60 tons additional dry matter per 50 pounds of nitrogen applied. Fertilizer nitrogen should be applied soon after stockpiling starts. If using urea, apply it just before a rain to reduce the loss of nitrogen by volatilization.

Tall fescue stands containing over 30-50% legume, will show little economic value from applying nitrogen for increased production. When red clover is the legume, the stand, can be managed for maintenance of the legume by properly timing grazing relative to seed production and frost. When using legumes to provide nitrogen, the fall growth can be lightly grazed to use the legume growth before it is lost to the freezing weather. This can be done with weaned calves to make the best use of the high quality legume forage. The grass can then be saved for later use by dry cows. If the legume forage is not used before or shortly after frost the usable forage yields from these legume-tall fescue stands may be reduced by half. Tall fescue clover stands should be grazed close during the winter or spring to encourage the establishment of legume seedlings. Dragging the pasture in early spring will spread the manure and seeds, ensuring a better distribution of seedlings and plant nutrients. By grazing the area after dragging the cattle will walk the seed into the soil surface improving seedling establishment.

Stockpiling tall fescue for winter grazing has to be planned. Due to low light intensity and cool temperatures little forage growth will occur after mid-October. For high yield and quality, deferral of tall fescue should begin between mid-July and mid-August. The earlier forage stockpiling starts, the greater the late fall and winter yield will be. If fescue is stockpiled before July quality will be lower and yield about the same. Research shows that 84% of the variation in stockpiled tall fescue yield can be accounted for by the number of days the stand is allowed to stockpile (Days) and the interaction of the number of days regrowth and the rate of nitrogen fertilizer applied at stockpiling (Nrate). There is also an effect of the location and year on dry matter yield. This location or year effect is due to differences in fall weather, soil conditions and management before stockpiling and at the December harvest. The location and year can change dry matter yields by ± 500 pounds per acre. The following equation predicts the effect of days regrowth and nitrogen rate on December dry matter yield within ± 500 pounds per acre.

$$\text{Dry matter yield} = (17.6 \times \text{Days}) + (0.08246 \times \text{Days} \times \text{Nrate}) - 767$$

Forage quality of stockpiled tall fescue is adequate for beef cows and ewes and is better than much of the hay put up for these animals. If fertilized with 50-100 pounds actual nitrogen in July or August the forage harvested about the first of December will yield 1 - 2 ton forage dry matter ranging between 11-16% crude protein and 60-65% digestibility.

To decrease waste of the forage and provide more uniform nutrition for the animals, rotationally graze the stockpiled tall fescue. If animals are allowed free access to stockpiled tall fescue they will eat only a part of the forage and trample much of the feed into the ground. By providing only what the herd will consume in 1-7 days, more forage will be eaten and less walked into the ground. One acre of a dense 8-10 inch tall fescue stand will feed 66 cows weighing 1200 lb. each for 1 day. In extremely cold weather forage intake may be higher.

Cattle will graze stockpiled tall fescue through fresh snow up to 8 inches deep. However, if the snow has a hard crust cattle will require supplemental feeding. Sheep learn how to paw the snow off stockpiled feed and can graze through the snow as well as or better than cattle.

Close grazing of the forage will increase use of the feed and can decrease the competitive nature of endophyte infected tall fescue in the spring. This will help maintain more legumes in the stand for use during the spring and summer grazing season. If you have seeded endophyte free tall fescue leave more stubble (2-4 inches) at the end of the grazing cycle to provide for a vigorous spring growth of tall fescue which will help ensure long term stand persistence. When grazing tall fescue during cold weather, livestock do not refuse the forage near manure piles as they do during summer grazing.

Managing Endophyte Infected Tall Fescue in the Summer

Daily gains of yearling steers grazing endophyte infected tall fescue decrease about 0.1 lb./day/ 10% increase in endophyte infection level. To improve summer performance, endophyte infected tall fescue can be managed to encourage other forages in the stand, which will dilute the effect of the endophyte. These forages can be grasses like bluegrass or crabgrass, or legumes such as red or white clover. Maintaining a legume in the stand will allow animal gain to increase by about 0.3 lb./day over nitrogen-fertilized infected fescue. To maintain legumes in a tall fescue stand, lime and fertilize the field to maintain a soil pH of 5.8 - 6.5 and a phosphorus and potassium soil test in the medium to high range. Avoid using nitrogen fertilizers such as poultry litter, manure, or commercial nitrogen fertilizers. Application of these materials to tall fescue stands, especially in the spring, will stimulate the grass growth, smother out clovers, and increase fescue toxicosis.

When grazing endophyte infected tall fescue don't let it grow too tall in the spring before turning in the

cattle. If rotationally grazing endophyte infected tall fescue, turn the cattle in when the grass is 4-6 inches tall and graze to a 1 inch stubble height. This management allows white clovers and Kentucky bluegrass to be more competitive, increase in the stand and dilute out the toxic effects of the infected fescue. If continuously grazing endophyte infected tall fescue pasture try to maintain a short canopy (2-3 inches tall) to encourage white clovers and bluegrass. Clip the tall fescue flower heads early to prevent seeding and to prevent cattle consuming the seed heads which are high in alkaloids. This will also result in better tillering and vegetative regrowth. When harvesting tall fescue for hay, take the first cut when the grass is in the late boot or early heading stage of development. This will minimize the amount of alkaloids in the forage and maintain forage quality so that feed intake will be higher.

Eradicating Infected Tall Fescue Stands

In most cases fescue toxicosis can be reduced or eliminated by management which reduces the intake of the toxic alkaloids by increasing other grasses and legumes in the forage stand. Another option is to use infected tall fescue at times of the year when the animals are less affected by the endophyte alkaloids. This would be in the cool weather of spring and late fall and winter to prevent the heat stress induced by the alkaloids. However, there may be situations when the eradication of endophyte infected tall fescue is economically the best alternative. This occurs on highly productive soils where a relatively high value animal product is being grown.

Eradication of an existing endophyte infected tall fescue stand is the last management option recommended. The practical success of the other two options, the costs and risks associated with killing an established sod, and establishing a new sod weigh heavily against this option. Evaluate your expected returns and costs carefully before pursuing this alternative.

Three management decisions have to be addressed and adhered to in order to make eradication a success. Is the manager willing to:

1. commit to the management required to kill the endophyte infected stand,
2. commit to preventing the reintroduction of endophyte infected seed,
3. commit to managing the new seeding for stand maintenance?

If you decide that the eradication of an infected tall fescue sod is the best option and the answer to the three questions are all yes, be prepared to take

two years to accomplish the task. The steps required are:

1. select a site on which machinery can be used;
2. soil test and add the lime, phosphorus and potassium needed for establishing a grass clover stand;
3. plan for the exclusion of endophyte infected seed to prevent the encroachment of new infected fescue seedlings;
4. prevent seed head formation by the infected fescue plants for one to two growing seasons before killing the stand;
5. kill the infected stand by growing a cultivated crop for two years or by using herbicides and no-till or minimum-till site preparation and planting;
6. prevent reintroduction of infected tall fescue seed to the field from seed on haying equipment; seed in winter fed hay, manure and bedding; or in manure from cattle which previously grazed in an infected fescue pasture containing ripe seed heads,
7. manage for the maintenance of the perennial species established.

It is possible to eradicate endophyte infected tall fescue and establish other perennial forages such as orchardgrass and endophyte free tall fescue. These forage stands can be maintained for years if the manager prevents the introduction of endophyte infected tall fescue seed and maintains the established forage through proper harvest and fertility management.

Managing Endophyte Free Tall Fescue

Tall fescue varieties which are free of the endophyte are available. These varieties are more palatable and will not cause health and performance problems encountered with infected tall fescue.

However, endophyte free varieties require more careful management than endophyte infected varieties.

New varieties of endophyte free tall fescue are developed by placing seed in a warm dry environment which kills the endophyte but retains seed viability. Keeping infected tall fescue seed in a warm dry room for 12 months will kill the endophyte while most of the seed will remain alive. The endophyte free seed is then planted and the seed produced by these plants is free of endophyte and sold as endophyte free seed.

When rotationally grazing endophyte free tall fescue-clover stands, start grazing when the plants reach an 8-10 inch height and remove the livestock when they have grazed most of the stand to a 2-3 inch stubble. Preferably use rotational grazing with a paddock occupation period of 7 days or less. Longer grazing stays or continuous grazing may result in overgrazing and the death of the endophyte free plants. In the spring it will take about a 3 week rest interval, while in the summer it will take about a 5-6 week rest interval for the plants to reach the desired pregrazing height. Use legumes such as ladino and red clover in the stand to supply nitrogen and to obtain increased animal performance.

Note that the recommended management for endophyte free tall fescue is much different than that for infected tall fescue. The recommendations for the infected tall fescue are designed to reduce the vigor of the tall fescue plants and encourage other grasses and legumes which are tolerant to close grazing to invade the stand and dilute out the toxic effects of the endophyte. The management of endophyte free fescue is desired to maintain a healthy vigorous tall fescue stand which will resist the encroachment of weeds, including endophyte infected seedlings which might get into the field.